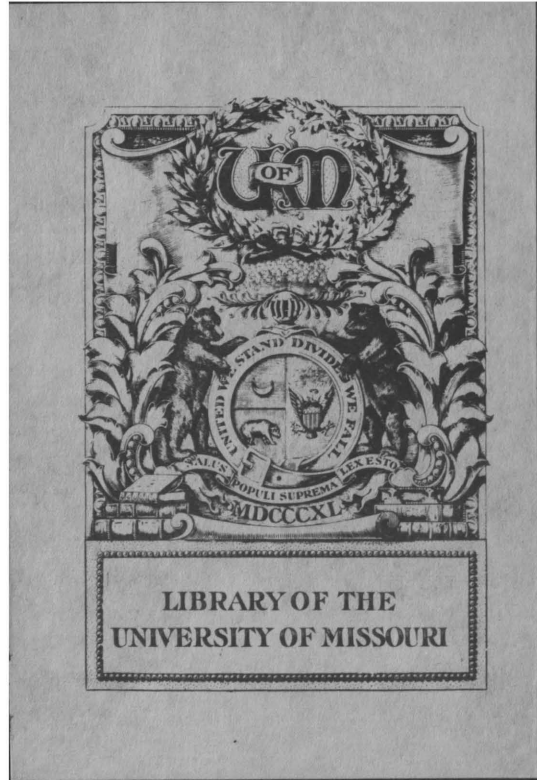


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THE INFLUENCE OF BREEDING YOUNG SWINE
UPON THE PARENTS, THE OFFSPRING
AND THE BREED

by

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The growth curves referred to in Chapter IX, bearing on the influence of the periods of pregnancy and lactation on the Growth of the Dam will be found at the extreme end of the thesis.

INTRODUCTION

There is no animal contributing directly to the food supply of the people which is at the same time so generally kept and so little understood as the pig. Nor is there one which, intimately associated as it is with their welfare, is so generally appreciated by the rural classes. While some farmers formerly bred and fed pigs for the purpose of consuming inferior and waste stuff and the production of manure, the farmer of to-day keeps a sow for the profit and satisfaction which she returns him in addition to the above. There are few farms in the United States to-day upon which there is not a brood sow. The sow occupies a high position with the farmer and contributes more to his prosperity than almost anything to which he devotes attention.

America has long been known as a swine-producing country of surpassing excellence, and claims to produce and consume more pork than any other nation. Missouri alone, in 1907, sent to market 3,878,863 head of hogs valued at \$38,788,630, and at that time Missouri ranked as fifth state in the Union in swine production.

From these statistics one can realize the important part which swine take in the welfare of our nation.

It would naturally be supposed that at this age the breeding of swine had reached perfection, and that little improvement is possible. This supposition would be erroneous, for breeders now differ in opinion on many points relative to swine husbandry, especially breeding. Chief among the subjects under discussion is the age of breeding. Where some breeders are content to wait until a gilt (young sow) has reached the age of say twelve months before breeding her, others prefer to commence when the gilt is eight or nine months old. A great many men believe the gilt cannot be bred too young, and permit her to be bred the first time she evinces a desire. The last mentioned persons believe that a young sow grows quite as well when she is with young and suckling pigs, as when she is not, and they consider it a waste of time, and consequently a loss of money, to wait until she is of more mature age, and when, in fact, under their system, she is ready for a second litter. Others believe that the growth of the dam is not checked while she is with young, but that the growth is retarded during the period of suckling.

On the other hand, those who prefer to wait until maturity believe that early breeding invariably checks the pigs growth and prevents a proper development of the frame, and for this reason they feed their young stock well until they are more mature before breeding.

For the production and maintenance of swine of the most vigorous description, it is essential then that certain questions having a distinct bearing on the subject be investigated. Many results influencing this subject have already been accomplished and in the following pages will be found a study of these results in connection with the data compiled from the Animal Breeding Experiment with Swine, which is now being carried on at the Missouri Experiment Station under the direction of Dean F. B. Mumford, and known as the Adams Fund Experiment.

The following four questions, in particular, which have a direct bearing on the subject of swine breeding, will be discussed, using the data furnished by the swine breeding experiment, and summaries drawn. In addition to these, others points of consideration will be investigated.

First.- What is the influence on the mother of early pregnancy and lactation.

Second.- What is the influence on the offspring? Are the offspring of young mothers less thrifty than offspring from mature mothers?

Third.- What effect has early breeding or breeding of young animals upon the race or the breed?

Fourth.- Granting that growth of young mother is

checked by early pregnancy, is it true that she is permanently small?

CHAPTER I

PLAN OF EXPERIMENT

The investigation which is here described has been in progress for about four years. It is known as an Adams Fund project, and has to do with age as a factor in animal breeding, the experiment being conducted with swine.

Following is the outline of the experiment:

What is the ultimate effect of the mating of young animals continuously upon,

A. Inheritance of characters. The following characters may be influenced:

- a. Size
- b. Constitutional Vigor
- c. Fecundity
- d. Prepotency
- e. Longevity

B. What is the effect of mating of young animals continuously upon the mother. The following characters may be influenced:

- a. Size
- b. Constitutional vigor
- c. Fecundity

- d. Prepotency
- e. Longevity
- A. Selection of the animals.
 - a. Select six sows of the same age, breeding, thrift and general quality.
 - b. Select a boar of the same breed and age.
 - c. Divide the six sows into three groups of two each.
 - Group one: Young parents.
 - Group two: Middle age parents.
 - Group three: Mature parents.

Group One - Young Parents:

Breed two sows of this group at four or five months of age (or at first heat) to boar of same age, (four or five months).

- I. Select twosows from the first litter from Group One and breed at four or five months of age to young boar as before.
- II. Feed all remaining pigs of the litters from young parents on the standard ration to a weight of 250 pounds.

Group Two - Middle Age Parents:

Breed two sows at eighteen months of age to baar of same age (eighteen months).

- I. Select two sows from these litters and breed at eighteen months of age to a boar of same age as before.

II. Feed all remaining pigs of these litters on the standard ration to a weight of 250 pounds.

Group Three - Mature Parents:

Breed two mature sows at thirty months of age to boar of same age (thirty months).

I. Select two sows from these litters and breed at thirty months to boar of same age as before.

II. Feed all remaining pigs of these litters on the standard ration to a weight of 250 pounds.

FEEDING PLAN

I. Feed all brood sows and boars on a standard ration as follows:

(a) Winter-

Corn five parts, linseed oil meal one part and clover hay.

(b) Summer-

Corn five parts, linseed oil meal one part and blue grass pasture.

II. Feed all barrows and sows not used for breeding on the same standard ration.

RECORDS

I. Feed Record-

A. Keep feed record of all breeding animals.

B. Keep feed record of all sows and barrows fattened.

II. Weight Records-

A. Weigh each animal in the experiment every ten days.

B. Weigh every pig at birth.

III. Other Records-

A. Number of pigs in litter.

B. Condition of pigs at birth.

C. General notes on animals at each ten day period
or oftener.

IV. Measurement Records-

Carefully measure with Missouri Experiment Station
calipers the growth of animals in the Experiment.

These measurements will help to determine,

First: The kind of growth.

Second: The rate of growth.

Third: The size at maturity.

V. Secure cannon bones and bones of the tail and such
other parts of the bony skeleton or viscera as will
in any way help to measure the extent of variations,
if any, resulting from the methods of breeding. Femur,
tibia, humerus, radius, and ulna should be preserved
for study.

THE MEASUREMENTS OF ANIMALS

THE CALIPERS DESCRIBED

A system of measurement is also used whereby the actual frame of the different animals can be compared. For all breeding hogs, these measurements are to be taken once a month. The starting and ending point for each measurement is to be, as far as possible, the prominence of some bone, for dependence can be placed on these measurements only as they measure the actual frame work of the hog.

The instruments used in taking the measurements described herein are centimeter tapes for lengths, and the Missouri Experiment Station calipers, consisting of a graduated standard with movable arms, which are used in the measurements of height, depth and width, except the width of shoulder points and width of head. These calipers consist of three wooden pieces, one long piece 90 centimeters in length, graduated in centimeters on both sides, and two shorter pieces perpendicular to this one, 25 centimeters in length. Each of these two shorter pieces is movable and slide either way along the longer piece. They are held at any point by a set screw. One of the shorter pieces and the longer piece is divided with a spirit level to insure that the measurements are taken exactly horizontally or vertically, as the case may be. The calipers always rested snugly against the flesh in measuring.

THE FACTOR OF AGE IN ANIMAL BREEDING

The importance of age as a factor in the breeding of the domestic animals has long been recognized. In the earliest records available are given particular and careful directions as to the age at which animals should first be bred. Among more modern writers the same careful directions and warnings against the mating of animals before they have reached a certain degree of maturity.

There is a well established belief among the best breeders of live stock that the mating of immature parents may result in a specific influence upon the size of the offspring, their constitutional vigor, their fecundity and probably their prepotency.

It has long been known to every breeder that the mating of young parents has an unfavorable influence upon the mother. Whether the development of the mother is permanently checked by early pregnancy, it is not possible to decide from any researches which have so far been made. It is possible to determine the extent of the injury resulting from too early pregnancy in our domestic animals.

Biologists and students of Thremmatology are in general inclined to the belief that the maturity of the parent can have no influence upon the inherited characteristics of the offspring. The supposed bad results of the practice of continu-

ously mating young animals are decreased size, diminished constitutional vigor, loss of fecundity and a change in the prepotency of our domestic animals.

Some investigators, however, have recognized possible injurious effects upon the offspring from too early mating of the parents.

C. B. Davenport says, "I have learned that in man there is a certain form of imbecility known as 'mongolianism' which is confined to first and last children, particularly the last born. As it does not appear to be heredity, it looks like a condition produced by lack of vigor on the part of the mother late in life or in adolescence."

E. Davenport says, "There is no doubt that the statements that are made derogatory to the use of immature parents is absurd, that the real difficulty, if any exists, is of importance and if you can find it out it will be one of the nice pieces of work full of valuable results."

CHAPTER II

TABLE I.

AGE AT WHICH FEMALES IN THIS WORK
WERE FIRST BRED

Immature Sows		Half-Mature Sows		Mature Sows	
Factor	Age	Factor	Age	Factor	Age
V	6 mo.	IIIx	8 Mo. 22 days	IV	24 mo 23 days
VI	4 mo. 21 days	VIIxx	19 mo. 25 days	VIII	35 mos. 24 days
XI	6 mo. 26 days	XIa	16 mos.	Xb	Not yet bred
XIV	6 mos. 7 days	Xa xxx	7 mos. 9 days	XIb	"
XXI	5 mos. 12 days			XIIb	"
XXII	6 mos. 11 days			XIIIb	"
Average	5 mos. 28 days	Average	13 mos.	Average	30 mos. 9 days.

(x) Accidentally bred May 22, 1909 and aborted August 24, 1909. Bred second time on May 27, 1910, being 20 months and 27 days old.

(xx) Factor VII bred first time on May 25, 1910, when 19 months and 25 days old. Again bred June 12, 1910, July 4, 1910, July 23, 1910 and farrowed first litter November 15, 1910, when 26 months and 15 days old.

(xxx) Accidentally bred.

Records were not kept as to just at what stage during the heat period the females were bred, but a discussion of this subject at this time will not be amiss. It is inter-

esting to note the following by Dean F. B. Mumford of the Missouri College of Agriculture, under whose direction the present swine breeding experiment at that station is now being conducted.

"The reproductive functions in animals are not fully developed at birth, and after reaching their full development decline with age. As the animal approaches maturity, the sexual organs become fully developed and the sexual instincts are prominent. This stage in the animal's life is called the period of puberty.

"Puberty.- In the female, puberty is coexistent with the ripening of the first egg, and indicates the time at which the young animal becomes capable of reproduction. The age at which puberty occurs varies considerably with the breed of the animal and the methods of handling during the first months of the animal's life. Young animals generally fed on a nutritious diet, reach the period of puberty considerably earlier than those fed on a sparse diet. Swine arrive at the period of puberty at three to seven months of age. The begin^{ing}-/of puberty does not represent the best time to breed. The artificial conditions which surround our domestic animals cause them to come in heat much younger than in a wild state. Great injury has been done by breeding females too young. The results of this practice have dim-

inished the size and decreased the fecundity of individual domestic animals, especially in the case of swine.

"The best age to breed will vary somewhat with conditions. When the breeding animals are very valuable, it is important to give each individual an opportunity to develop perfectly. In commercial stock husbandry, it is sometimes more profitable to sacrifice somewhat of full development to early maturity and quick returns. The experience of breeders indicates that eight to twelve months is the best age for breeding swine."

The period of puberty is that period or age at which an animal is capable of begetting or bearing young. The gilt is usually in heat about every 21 days after the age of four or five months, the ^{heat} period being from two to four or five days. It is claimed that the best time for service is about the middle or height of the period. This period of heat includes the prooestrus, or time of preparation, and oestrus, or the time when the sow is ready to receive the boar. Mackenzie and Marshall found that "during the prooestrus, which lasts for perhaps two or three days, the uterus and generative tract become congested and the congestion may also extend to the mammary glands. The ovaries at this time contain numerous Graaffian follicles, which from their de-

gree of protrusion are evidently in a state of almost complete maturity. Ovulation, however, does not take place until oestrus, or the period of actual desire (or at any rate not until a late stage in the prooestrus). Thus in two Large Black sows which were killed when in heat the uterus in each case was enlarged and congested, but the ovaries contained no corpora lutea. On the other hand a number of large follicles were present, thereby showing that ovulation had not yet taken place. In another black sow, killed five days after signs of prooestrus had been noticed, it was found that ovulation had not even then occurred, though there were numerous protruding follicles but no ruptured ones. In a Middle White sow killed a week after heat was first noted, ovulation had taken place and there were numerous developing corpora lutea in each ovary. In another white pig killed during heat (and almost certainly during oestrus) ovulation had just occurred, as was apparent from the presence of newly ruptured follicles. It is clear therefore that the beginnings of mammary growth are not due to a nervous reflex set up by ovulation. Moreover, these observations bear out the statement by Sanders Spencer, that it is best for sows to be served late rather than early in the heat period, and that if they are put to the boar too soon they are liable to be barren to the service. It would

seem probable, if not certain, that union between the ova and spermatazoa is most easily secured when the latter are introduced into the female generative passage at about the same time as the liberation of the ova, and consequently that if copulation precedes ovulation by too considerable an interval the chances of the ova becoming fertilized are much reduced."

Sanders Spencer says: "We have found that sows are most likely to prove in pig when mated at the later part of the period of oestrus."

CHAPTER III

THE INFLUENCE ON THE MOTHER OF
EARLY PREGNANCY AND LACTATION

The measure of success attained by those who raise hogs, depends in no small degree upon the judicious selection, for breeding purposes, of sows that are best calculated in their form and general make up, to give birth to, and to nourish for several weeks, a reasonable number of well-formed, thrifty, vigorous pigs. In this connection the subject of early or late breeding has considerable bearing. The proper age at which to breed the females is a question with many. If gilts can be bred decidedly earlier than is now being advocated, there are many advantages to be gained. If an animal can be bred when the first signs of heat are noticed and produce on an average the same number of pigs of equal weight as the more mature animals and at the same time not impair her growth and functions, the profit accruing from such a practice is clearly seen.

However, it is the general opinion that sows bred early in life do not produce as many pigs per litter, that the pigs are not as thrifty, and that the dam's growth and functions receive a set-back from which they may never re-

cover and this in turn is stamped on the offspring.

WHEN SOWS COME IN HEAT

Sows, well kept, will in some cases come in heat when not more than three months old, and the period of puberty varies from three to seven months with swine. Young animals generously fed on a nutritious diet reach the period of puberty considerably earlier than those fed on a sparse diet, hence the period of puberty does not represent the best time to breed. In fact, it is claimed by scientists and practical breeders that great injury comes from breeding females too young. Mumford states that the results of this practice have diminished the size and decreased the fecundity of many ^{individual} domestic animals, especially in the case of swine.

In order to determine whether or not the breeding of young animals is deleterious to the mother, the experiment outlined heretofore has furnished the following data.

For convenience, the sows in the experiment have each been given a name, such as Factor V, Factor VI,

etc., and in order to make it more convenient the three classes of sows have each been given a name. For instance, the sows which were bred the earliest, are, in this thesis, called "Immature" sows; those which were bred when somewhat older, or mature, are called "Mature" sows, and the class between immature and mature sows, are called "Half-Matured" sows. Hereafter each class will be called according to the above names.

Factors V, VI, XI, XIV, XXI, and XXII, are in the immature class.

Factors III, VII, Xa, and XIa are in the half-mature class.

Factors IV, VIII, Xb, XIb, XIIb, and XIIIb are in the mature class.

Measurements were taken of each animal and recorded, and these measurements give some idea of the extent of comparative growth in animals which were bred when immature, half-mature and mature, showing the effect which was produced on the growth of the mother by early breeding.

The following tables include comparative measurements of the height at withers, length of body, heart girth, breadth at shoulder and depth of chest, and in some instances weight of body.

The age at which the first measurements were taken is

practically the same, varying from 5 to 8 months in some cases, but averaging 6.5 months of age. The measurements were taken as regularly as possible, and are enumerated in the tables to follow in periods of 10 to 14 months. The measurements are all by centimeters, except with reference to weight, when they are read as pounds, so in order to save repetition, all measurements will be understood as being given in centimeters, and it will not be necessary to state this hereafter.

AGE AT WHICH SOWS WERE BRED

The immature class of sows, factors V, VI, XI, XIV, XXI, and XXII, were bred at six, five, seven, six, six and seven months of age respectively.

The half-mature class of sows, factors III, VII, Xa, and XIa, were bred at nine, nine, eight and twenty months of age, respectively.

Factors IV and VIII, the mature sows, were bred at twenty-five and thirty-three months of age, respectively. The other four factors in the mature class of sows, Xb, XIb, XIIb and XIIIb have not as yet been bred.

LENGTH OF BODY

The length of a hog very often is not given due consideration, although good length is decidedly essential in breeding animals, not only in the boar, but more particularly in the sow. Breeders have always looked for good length of body in the breeding sows, for these matrons usually produce and take care of good, strong litters. Experiments at various agricultural experiment stations go to show that the sows with good length of body are more desirable than the short, chuffy animals. Any hindrance, therefore, in the development of breeding swine which checks the growth of length of body is detrimental. The table on length of body gives a comparison of the measurements of the length of body for all three classes of sows.

To begin with, attention should be called to the fact that the animals had a decidedly fair start with each other, for average first measurements at practically the same age show that the immaturely-bred class of females were just as large as the mature sows, and in truth had more advantage at start than the latter mentioned class, for the first measurements of 4 of the sows in the mature division were 8 months old when the first measurement was

taken. As the figures stand, however, the average first measurement of the immature and mature sows is exactly the same, 77.63, while half-mature sows average but 71.75. It would seem, therefore, that the growth or development of body length was checked by early breeding of the immature class, for at the end of the first period^(10-14 mos.) we find that the average measurement for maturely-bred sows is 87.6 and that of immaturely-bred sows is but 82.71, showing that the former class of sows had made a gain of 9.97 while the latter grew but 5.08, there being at this time a difference of 4.89 in their average measurements in favor of the more mature animals. Half-mature sows had not as yet overtaken the development of either of the other class, their average measurement being 81.38, 1.33 smaller than immature sows and 6.22 smaller than mature sows. They had made a growth in length of body of 9.63 in the same length of time it took immature sows to grow 5.08, showing the advantage to be gained in permitting the gilts to become more mature before breeding. This is all the more striking because of the truth that the average first measurement of half-mature sows was 71.75 and that of immature sows 77.63.^(20-28 months)

At the close of the second period it will be noted

that the half-mature sows had made growth sufficient to surpass the immature sows. Immature sows averaged 92.31, half-mature sows 97.55, and mature sows 107.7. During this period immature sows made an average growth of 9.60, half-mature sows 16.17, and mature sows 20.1, the figures being decidedly in favor of the older sows which were not bred until they were well along toward maturity.

The immature sows had an average length of body of 94.85 at the expiration of the third period, ^(30-42 months) with half-mature sows 109, and mature sows 109.7. It will be noted, however, that there was but one half-mature sow to consider during this period, with the exception of one measurement. During this time immature sows made a growth of 2.54, half-mature sows 12.50, and mature sows 2.0. Half-mature sows were 14.20 longer than immature sows, having made a growth of 37.3 from the time of the first measurement, while immature sows made development only to the extent of 17.22. Mature sows had made a gradual, steady increase in length of body, making an average growth of 22.07.

For the entire measuring period, immature sows had an average length of body of 89.96, half-mature sows 93.64, and mature sows 101.67, showing mature sows 11.71

longer than immature sows, and 8.03 longer than half-mature sows. There was 3.68 difference between immature and half-mature sows, in favor of the latter.

The more mature females made the best growth and development in length of body, while the sows which were early bred made slower and less growth.

TABLE II.

LENGTH OF BODY

THE INFLUENCE ON THE MOTHER OF EARLY PREGNANCY & LACTATION

	IMMATURE SOWS	HALF-MATURE SOWS	MATURE SOWS
Avg. Age of 1st Msmt.	6 mos.	6 mos.	7 mos.
Avg. of 1st Measurement	77.63	71.75	77.63
Avg. Measurement end of 1st period	82.71	81.38	87.6
Avg. Measurement end of 2nd period	92.31	97.55	107.7
Avg. Measurement end of 3rd period	94.85	109.0	109.7
Grand Avg. Measurement for all periods	89.96	93.64	101.67

The above table shows the influence on the mother of early pregnancy and lactation, and gives a comparison of the effect these have on the development of the length of body of the three classes of sows in this experiment, the immature sows, the half-mature and the mature sows, showing the measurements at the expiration of the three different periods, and the grand average measurement for all three periods.

DEPTH OF CHEST

One of the influential points in the proper conformation of swine is good depth and breadth of chest. Probably more emphasis can be given to the chest than to the heart girth, as an indication of constitution in a hog. Dietrich makes the following statement regarding constitution, which has a particular bearing on the data compiled herewith: "The constitution of the hog should be as good as possible. That is, his chest should be capacious. This is indicated by having the brisket well advanced and low down so that the lower wall of the chest is on a level with the under line of the balance of the body. His flanks both rear and front should be full and well let down."

The figures in the foregoing table give a comparison of the measurements of chest depth of the three classes of sows in this experiment.

At first glance it will be noted that the older sows have the greatest depth of chest at all periods. This is very significant, especially since Dietrich places so much importance on this one part of the conformation of a hog.

The first measurements of all the animals in all three classes were taken at practically the same age. The

average depth of chest of immature sows was 29.13, half-mature 27.75, and mature 28.75, the immature females being 1.38 larger than half-mature sows and .38 larger than mature sows. At the end of the first period^(10-14 months) the figures show that the more mature sows have made more rapid growth than the early bred sows, and the sows in the immature class have a lower average measurement for depth of chest than either of the other two classes of females. In this short time they have received a check in growth as a result, evidently, of early breeding, which hindered them from developing to the same extent as did the other sows bred later. At the end of the first period immature sows have an average depth of chest of 32.18, half-mature sows 32.76, and mature sows 34.9. The mature sows were 2.72 larger than immature sows and 2.14 larger than half-mature sows.

At the end of the second period^(20-28 months) immature sows had an average measurement of 37.68, half-mature 40.92, and mature sows 43.87. Mature sows had made a gain of 8.97, compared with a gain of 8.16 for half-mature sows and 5.50 for immature sows. Immature sows were 3.24 and 6.19 smaller in chest depth than half-mature and mature sows, respectively. Mature sows were 2.95 larger than half-mature sows.

The figures at the close of the third period^(30-42 months) show

practically the same results as do the other periods. Immature sows made an increased growth of 2.61, half-mature sows 2.92, and mature sows 1.90. The figures at the end of this period also show that immature sows have made a growth of 11.16 in depth of chest for the entire time, while half-mature sows have developed 16.09 and mature sows 17.02. It will be noted that each class of sows is approaching its maximum growth, or maturity. Immature sows had an average chest depth of 40.29 at the end of the third period, half-mature sows measured 43.84, and mature sows 45.77, the older sows still leading by a good margin, being 1.93 deeper in the chest than half-mature sows and 5.48 larger than immature sows. The immature sows made a gain of .71 toward equalling the measurements of the mature sows, and 1.31 toward equalling the measurements of the half-mature sows. Evidently it will be impossible for the immaturely-bred sows to develop sufficiently in depth of chest to equal the measurements of the half-maturely and maturely-bred sows before or after the latter are matured, for the former will have matured before this growth can be attained.

The final figures for the average depth of chest for all three classes during the three periods give

immature sows an average measurement of 36.72, half-mature sows 39.17, and mature sows 41.51, the mature sows being 4.79 deeper in chest than immature sows and 2.34 deeper than half-mature sows, which latter class were 2.45 deeper than immature hogs.

Thus it will be seen that the sows which were allowed to mature more fully before being bred made the greatest development in depth of chest, which is such an important characteristic of the conformation of breeding swine, having that peculiar relation to constitutional vigor which is sought for to such a great extent.

F. B. Mumford, in preparing a scale of points for a score-card for fat hogs, breeding hog class, gives 8 points out of 100, as a perfect score for chest, and requires that the chest be "deep, wide and full; breast bone advanced." He gives 5 points out of 100 as a perfect score in the bacon hog score card, breeding hog class, and requires that the chest be "deep; full in heart girth."

In the scale of points in scoring Duroc Jersey swine, 12 points are given as a perfect score for chest, and one of the disqualifications of the breed is given as "small cramped chest". The chest is required to be

"large, very deep, filled full behind shoulders; breast bone extending well forward so as to be readily seen". Under the heading of objections in the conformation of Durocs, under "Chest", is given the following: "Flat, shallow, or not extending well down between fore-legs."

The Poland China score card also gives 12 points as a perfect score for chest, and requires that the chest be "large, wide, deep and full; even under-line to the shoulder and sides with no creases; giving plenty of room for heart and other organs, making a large girth, indicating much vitality." The score card gives as objections under chest, the following: "Pinched appearance at the top or bottom, or tucked in back of fore-legs; showing too narrow between the legs; not depth enough back of the shoulder."

Tamworth swine are required to have a chest "wide and deep." The Hampshire swine score-card gives 12 points out of 100 as a perfect score for chest, "large, deep and roomy; full girth, extending down even with line of belly." The Chester White swine score-card gives 9 points out of 100 as a perfect score for chest.

Curtis, in discussing the selection of brood sows makes the following statement: "The mother should be an animal of strength and vigor, as it is necessary for the

feed she eats not only to maintain her own body, but at the same time nourish a litter of pigs. A really useful sow should be capable of doing this work for a period of five or six years or even longer. This requires a strong constitution, which is indicated by a broad, deep chest, and plenty of capacity for digesting large quantities of food."

The above citations are made in this connection to show the importance or influence attached to the form of the chest in the proper conformation of breeding swine.

TABLE III.

THE INFLUENCE ON THE MOTHER OF EARLY PREGNANCY & LACTATION

DEPTH OF CHEST

	IMMATURE SOWS	HALF-MATURE SOWS	MATURE SOWS
Avg. Age of 1st. Msmt.	6 mos.	6 mos.	7 mos.
Avg. of 1st Measurement	29.13	27.75	28.75
Avg. Measurement end of 1st period	32.18	32.76	34.9
Avg. Measurement end of 2nd period	37.68	40.92	43.87
Avg. Measurement end of 3rd period	40.29	43.84	45.77
Grand Avg. Measurement for all periods	36.72	39.17	41.51

The above table shows the influence on the mother of early pregnancy and lactation, and gives a comparison of the effect these have on the development of the depth of chest of the three classes of sows in this experiment, the immature sows, the half-mature and the mature sows, showing the measurements at the expiration of the three different periods, and the grand average measurement for all three periods.

THE HEART GIRTH

Since a good heart girth in swine is indicative of strong constitution and vigor, the foregoing table giving the comparative measurements of the three classes of sows for this part of the body, is important.

The figures are self-explanatory, and show, with one slight exception, that the older sows had the largest heart girth. The exception is found at the end of the first period when immature sows had an average heart girth of 103.05, and half-mature sows averaged 102.1, or .95 less than immature sows. In this period, however, mature sows showed an average measurement of 109.85, leaving a big margin between them and the younger animals of 6.80 and 7.75, respectively.

The exception explained at the end of the first period is hardly noticeable when the figures are compared at the end of the second period. By this time the half-mature sows have increased in heart girth and far surpass the younger sows in heart girth, having an average measurement of 129.8, compared with 113.55 for immature sows. Where half-mature sows were .95 smaller in girth at the end of the first period, they are now 16.25 larger than immature sows. These figures speak much for

the practice of breeding more mature animals. While the half-mature sows made a gain of 27.7 in heart girth, the young sows made a gain of but 10.50 in the same length of time, which gives the older sows a decided advantage. In this same period mature sows made a growth of 27.65 in heart girth, maintaining a lead of 7.7 over half-mature sows, and 13.95 over immature sows.

The averages at the end of the third period have practically the same relation to the development of the heart girth as did the figures at the end of the second period. Immaturely-bred sows were still undeveloped to the extent that the older sows were, and averaged 122.4 in measurement compared with 134.8 and 139.4 for the half-mature and mature classes of sows, respectively. Maturely-bred sows were 17.0 larger than immaturely-bred sows, and 4.60 larger than half-maturely-bred sows, while the middle class averaged 12.4 larger than the early bred sows. During the time between the second and third periods the immature sows made an average development in heart girth of 8.85, half-mature sows 5.0, and mature sows 1.9. At this stage in the development it was evident that maturity in the older animals was not far off.

The average measurements for the three periods still

tend to show the advantage to be gained in breeding older animals, or more mature animals. The mature class of sows maintains its advantage and shows that if large heart girth is suggestive of constitutional vigor, the more mature animals are much to be preferred for breeding. Dawsons verifies this statement by saying that mature sows are more prepotent than gilts; that gilts farrow pigs that finish frame growth at too young an age.

There is such a striking difference between the measurements of the older sows and the younger sows that there is no room for doubt, so far as this experiment is concerned, but that the development of the heart girth of the immaturely-bred sows is checked by early pregnancy and lactation. Further, the figures show vividly that the growth is checked not only for a short time, but during the life of the female to date.

The immature sows had an average heart girth of 113 during the three periods, the half-mature sows averaged 122.2, and the mature sows averaged 128.92, showing the mature sows to have a heart girth larger than the younger animals by 15.92 and 6.72 respectively. Half-mature sows

even though they did not equal the measurements of the immature gilts at the end of the first period, were 9.2 larger on the average, showing that the early breeding evidently influences the slow development of heart girth.

Dietrich, in discussing the constitution of the hog, says that very often the mistake is made by judging the constitution of a hog with a tape line, considering that the individual which has what is called good heart girth has good constitution. In such cases allowance is not made for the differences in size and differences in condition as well as very often differences in conformation. The hog may have a very thick, heavy shoulder, and have a great deal of fat on the outside of the carcass, which would give him considerable heart girth, and at the same time he might be very weak in constitution. He might have a small chest capacity which would not leave sufficient room for the vital organs to be of proper size and to do the work that they should. While Dietrich's statement in this regard is true, it does not apply to this particular experiment, because of the fact that the animals used in this experiment were all of similar breeding and practically identical in body character. They were a decidedly uniform lot of individuals.

The consideration of chest capacity of the females in this experiment will be taken up later.

F. B. Mumford, in giving general characters of breeding fat hogs says that constitution is indicated by ample heart girth.

TABLE IV.

THE INFLUENCE ON THE MOTHER OF EARLY PREGNANCY & LACTATION
HEART GIRTH

	IMMATURE SOWS	HALF-MATURE SOWS	MATURE SOWS
Avg. Age of 1st Measmnt.	6 mos.	6 mos.	7 mos.
Avg. Measurement end of 1st period	103.05	102.1	109.85
Avg. Measurement end of 2nd period	113.55	129.8	137.5
Avg. Measurement end of 3rd period	122.4	134.8	139.4
Grand Avg. Measurement for all periods	113.0	122.2	128.92

The above table shows the influence on the mother of early pregnancy and lactation, and gives a comparison of the effect these have on the development of the heart girth of the three classes of sows in this experiment, the immature sows, the half-mature and the mature sows, showing the measurements at the expiration of the three different periods, and the grand average measurement for all three periods.

BREADTH OF SHOULDERS

In the measurements of the breadth of shoulders it will be noted that at no period in the growth of the different classes of sows did the immature animals equal those of the half-mature or the mature sows, although the animals when first measured were practically equal. Evidently early pregnancy hindered the development of the immature sows in the growth of breadth of shoulders.

At the end of the first six-months period the immature sows had an average measurement of breadth of shoulders of 29.79, compared with an average of 30.33 for half-mature sows and 32.38 for mature sows, showing a marked difference in favor of the more mature animals.

The average measurements at the expiration of the second period show even a more marked difference in the measurements to the advantage of the older sows. At the end of the first period the half-mature sows measured .54 more in breadth at shoulders than did the immature sows, and the mature sows measured 2.59 more than did the immature sows and 2.05 more than the half-mature sows, while at the end of the second period the half-mature sows had a margin of 4.10 in their favor over the immature sows, mature sows a margin in their favor of 8.32 over immature sows, and 4.22 over half-mature sows. All the data points

toward the older sows as benefiting by not having been bred early (from five to seven months of age).

The end of the third period shows the immature sows have made sufficient growth to lessen the margin of difference between them and both the half-mature and mature sows, compared with the measurements at the end of the second period, but as yet they have not regained half of the difference shown in the measurements at the end of the first period. The immature sows still show a difference of 3.17 in favor of the half-mature sows and 5.14 in favor of the mature sows, and mature sows still have an advantage of 1.97 over the half-mature dams.

The average measurements for the entire period during life are unmistakably in favor of the older sows. Mature sows had an average breadth at shoulder of 38.9, while half-mature sows averaged 36.15 and immature sows 33.55, a difference of 5.35 between immature and mature sows, and 2.75 between half-mature and mature sows, and 2.6 between immature and half-mature sows, all figures of difference being in favor of the more mature sows, and seemingly showing the advantage older sows have in the matter of growth.

Evidently, early breeding, as shown by these figures, has a tendency to hinder development in the early bred

females.

The importance of having good, broad shoulders in the brood sow can partially be realized by quoting the requirements of the brood sow from this point by noted authorities.

Mumford, in an outline for a scale of points for breeding fat hogs, which is the type of hogs used in this experiment, requires that the shoulders be "broad", and gives 8 points out of 100 as a perfect score for breadth of shoulders.

Critchfield states that the shoulder of the fat hog has considerable market-value, and hence should be largely developed. "It should be broad, deep and smooth".

TABLE V.

THE INFLUENCE ON THE MOTHER OF EARLY PREGNANCY & LACTATION

BREADTH AT SHOULDER

	IMMATURE SOWS	HALF-MATURE SOWS	MATURE SOWS
Avg. Age of 1st Measurement	6 mos.	6 mos.	7 mos.
Avg. Measurement end of 1st period	29.79	30.33	32.38
Avg. Measurement end of 2nd period	34.35	38.45	42.67
Avg. Measurement end of 3rd period	36.5	39.67	41.64
Grand Avg. Measurement for all periods	33.55	36.15	38.9

The above table shows the influence on the mother of early pregnancy and lactation, and gives a comparison of the effect these have on the development of the breadth at shoulder of the three classes of sows in this experiment, the immature sows, the half-mature and the mature sows, showing the measurements at the expiration of the three different periods, and the grand average measurement for all three periods.

HEIGHT AT WITHERS

In the measurements of the height at withers for the first period it will be noted that the immature sows averaged 51.69 c.M., the half-mature sows averaged 52.99 and the mature sows 56.1. At the end of the second period the immature sows averaged 58.47, the half-mature sows 62.81, and the mature sows 66.71. The same corresponding increase in favor of the more mature sows was noted at the end of the third period, the immature females averaging 62.21, the half-mature 65.67 and the mature sows 69.19.

The grand average of the entire measurements for the life of all the animals, covering a period of practically four years, showed that the more mature animals made better growth in regard to height at withers than the less mature animals, the immature sows having an average height at withers of 57.46, the half-mature sows 60.49, and the mature sows having an average of 64. This shows the mature sows 6.54 larger at height at withers than the immaturely-bred sows, and 3.51 larger than the half-maturely bred sows, while the half-mature sows are 3.03 larger than the immature sows.

Attention should be directed in connection with these figures to the fact that the first measurements of all three classes of sows were practically the same at

almost the same age. The average first measurement of the immature sows was 49.25, the half-mature sows 47, and mature sows 50.5, which figures show a decidedly fair comparison in the final averages. The fact that the half-mature sows, whose average first measurement was 2.25 below that of the immature sows, made better development as they grew older than did the immature sows, is evidence that early pregnancy and lactation evidently has a detrimental influence on the development of the mother, so far as height at withers is concerned.

TABLE VI.

THE INFLUENCE ON THE MOTHER OF EARLY PREGNANCY & LACTATION

HEIGHT AT WITHERS

	IMMATURE SOWS	HALF-MATURE SOWS	MATURE SOWS
Avg. Age of 1st Measurement	6 mos.	6 mos.	7 mos.
Avg. Measure- ment end of 1st period	51.69	52.99	56.1
Avg. Measure- ment end of 2nd period	58.47	62.81	66.71
Avg. Measure- ment end of 3rd period	62.21	65.67	69.19
Grand Avg. Meas- urement for all periods	57.46	60.49	64.0

CHAPTER IV

THE INFLUENCE OF EARLY BREEDING ON
THE GROWTH OF THE OFFSPRING

The question of whether or not the progeny of immature animals is necessarily faulty, is a doubtful one. Therefore, the following tables bearing on this subject are interesting. Davenport writes on this point as follows: "The general opinion seems to be that breeding from immature animals is bad. In truth we have little exact information on which to rely, but the writer seriously questions the correctness of this conclusion from the standpoint of the offspring. That breeding at an immature age checks the growth of females is next to certain, but it is also true that the heifer will make a better milker and a more certain breeder if bred before maturity and before functions other than milk production have become the prevailing habit of life."

The following by Jones also has reference to this subject: "The majority of the breeders who answered the questions in reference to animal breeding are evidently convinced that the offspring from young immature parents are smaller at birth and eventually develop into animals of inferior size with a tendency to a weakened constitution. A number of breeders claim that the offspring from the immature female takes longer to reach maturity. In

explanation of this question it may be stated that this is due to the stunted and weakened condition of the offspring, owing to the fact that it was not properly nourished either before or after birth."

The accompanying table compiled by Das, from records taken in connection with the Swine Breeding Experiment at the Missouri Experiment Station gives a good comparison of the first generation with the original stock at from 8 to 20 months of age.

From this table it is apparent that the first generation of sows from immature parents excelled the parent stock in body weight and breadth at the shoulders. There was very little difference in heart girth, while the first generation was inferior in height at the withers, breadth at the shoulder points, hip bones and depth of chest.

TABLE VII.

THE EFFECT OF EARLY BREEDING ON THE GROWTH
OF THE OFFSPRING (By Das)

(The average record of the sows from 6 to 20 months of age).

Name of Sow	Original Stock		1st generation		Average	
	V	VI	XI	XIV	Original stock	1st Generation
No. of Record	8	8	9	9	8	9
(1) Wt. of Body	193.8	(2) 173.6	194.7	190.6	183.7	192.6
Ht. at Withers	56.8	54.6	50.4	53.2	55.7	51.8
Brdth. Shoulder	30.0	28.0	30.8	29.7	29.0	30.2
Brdth. Shoulder Points	28.5	25.6	26.5	25.0	27.1	25.75
Brdth. Hipbones	25.9	23.7	22.6	21.8	24.3	22.2
Heart Girth	107.8	100.5	105.6	103.3	104.3	104.4
Depth Chest	36.0	33.2	33.1	32.8	34.6	32.9

(1) The number of records for height was 18.

(2) All weights have been taken in pounds, the other figures in centimeters.

THE EFFECT OF EARLY BREEDING ON THE GROWTH OF THE OFFSPRING

Average Record of Immature Sows to 11 Months

Factor	Original Stock		First Generation		Second Generation		Third Generation	
	V	VI	XI	XIV	XXI	XXII	XXX	XXXI
Avg. Wt. of Body	148.17	131.84	171.31	162.52	191.00	182.2	215.0	199.37
Height at Withers	54.13	52.13	45.38	46.25	50.4	50.2	52.85	54.17
Length of Body	77.13	73.5	70.00	73.75	86.0	84.0	88.42	85.00
Heart Girth	99.00	95.5	90.25	88.00	105.	97.03	107.28	112.72
Breadth at Shoulders	28.38	25.88	26.38	25.63	40.75	36.14	34.72	34.00
Depth of Chest	31.88	30.25	27.88	27.13	40.84	35.91	32.85	31.06

AVERAGE

Original Stock	First Generation	Second Generation	Third Generation
140.0	166.86	186.6	207.18
53.13	45.81	50.3	53.51
75.31	71.87	85.0	86.71
97.25	89.12	101.01	110.0
27.13	26.00	38.44?	34.36
31.06	27.50	38.33?	33.56

Factors XI and XIV are out of Factor VI. Factor XXI is out of Factor XI. Factor XXII is out of Factor XIV. Factors XXX and XXXI are out of Factor XXII.

From a study of the table of the immature sows to 11 months of age, it will be noted that the first generation was decidedly smaller in every particular than the original stock, with the exception of weight. There was an increase of 26.86 lbs. in favor of the first generation over the original stock and the second and third generations show a steady increase in weight. The second generation was 19.86 lbs. heavier than the first generation and 46.6 lbs. heavier than the original stock. The third generation was 20.58 lbs. heavier than the second generation, 40.32 lbs. heavier than the first generation and 67.18 lbs. heavier than the original stock.

The first generation, however, was inferior in size in all other points considered. They were 7.32 cm. smaller in height at withers, 3.44 cm. shorter in length of body, 8.13 cm. smaller in heart girth, 1.13 cm. narrower in breadth of shoulders, and 3.56 cm. shallower in depth of chest.

The second and third generations far exceeded the records of the original stock and first generation, with one

exception; In height at withers the second generation did not equal the record of the original stock by 2.83 cm., but was 4.49 cm. larger than the record of the first generation.

The only noticeable effect, then, of early breeding on the growth of the offspring is found in the first generation, which is inferior to the original stock and the succeeding generations enumerated, while the second and third generations are superior to the other two groups.

HALF-MATURE SOWS

GROWTH OF OFFSPRING

The following table shows the average record of the half-mature sows to eleven months of age. The first and second generations never equalled the original stock in body weight, but in the measurements the two generations were superior in almost every part of the body to the original stock. The one exception in this was that the first generation was inferior in length of body by 2.92 cm. This gives a fairly good check on the immature sows. Factor XI is out of Factor VII; as is also Factor Xa. Factors XIIa and XIIIa are both out of Factor III. With the exception of body weight in both generations, and length of body in the first generation, the original stock was inferior to the offspring in the half-mature class of sows.

TABLE IX.
EFFECT OF EARLY BREEDING ON THE GROWTH
OF THE OFFSPRING

Average Record of Half-Mature Sows to 11 Months

Factor	Original Stock		First Generation		Second Generation	
	III	VII	XIa	Xa	XIIa	XIIIa
Avg. Wt. of Body	153.52	152.21	137.47	119.33	117.14	135.77
Height at Withers	52.5	53.25	53.16	58.5	52.8	55.0
Length of Body	79.5	79.5	83.16	70.0	84.2	89.0
Heart Girth	95.25	100.0	103.16	95.2	98.0	105.0
Breadth at Shoulders	27.12	29.37	31.66	28.8	28.8	32.2
Depth of Chest	30.25	30.50	33.0	29.8	32.0	33.8

AVERAGE

152.86	128.50	126.46
52.88	55.83	53.9
79.5	76.58	86.6
97.62	99.18	101.5
28.24	30.23	30.5
30.37	32.4	32.9

GROWTH OF OFFSPRING

MATURE SOWS

The table which follows serves as another check on the growth of the offspring for the immature sows. This table gives the average record of the mature sows to eleven months of age, and again it will be found that the first and second generations did not equal the average weight of body of the original stock but the measurements of all parts of the body were greater in the first and second generations than in the original stock. In every measurement, with the exception of the average weight of body, the offspring were superior to the original stock. Since the offspring show so much more growth and developing with this exception, it might be said that the offspring from more mature sows make better growth than the offspring from immature sows, for the growth of the offspring from immature sows and half-mature sows is not as constant and as great as the growth of the offspring from mature sows.

Factor Xb is out of Factor IV. Factor XIIIb is out of Factor VIII, and Factors XIb and XIIb are both out of Factor IV.

TABLE X.

EFFECT OF EARLY BREEDING ON THE GROWTH
OF THE OFFSPRING

Average Record of Mature Sows to 11 Months

Factor	Original Stock		First Generation		Second Generation	
	IV	VIII	Xb	XIIIb	XIb	XIIb
Avg. Wt. of Body	148.37	149.52	130.02	127.78	115.0	122.77
Height at Withers	54.75	54.25	58.5	53.4	54.0	56.0
Length of Body	80.0	80.5	88.5	88.6	87.5	83.75
Heart Girth	98.75	98.75	110.25	106.2	105.5	109.5
Breadth at Shoulder	28.88	29.0	32.25	32.0	32.0	32.5
Depth of Chest	32.5	31.75	35.25	34.0	33.5	35.0

AVERAGE

Original Stock	First Generation	Second Generation
148.95	128.90	118.89
54.50	55.95	55.00
80.25	88.55	85.63
98.75	108.23	107.50
28.94	32.13	32.25
32.13	34.63	34.25

TABLE XI.

THE GROWTH OF THE OFFSPRING OF IMMATURE SOWS

COMPARED WITH THE GROWTH OF THE OFF-

SPRING OF HALF-MATURE SOWS

To 11 months of age.

Average records.

By generations.

Factor	Original Stock		First Generation		Second Generation	
	Immature Sows	Half-Mature	Immature Sows	Half-Mature	Immature Sows	Half-Mature
Avg. Wt. of Body	140.0	152.86	166.86	128.50	186.6	126.46
Height at Withers	53.13	52.88	45.81	55.83	50.3	53.9
Length of Body	75.31	79.5	71.87	76.58	85.0	86.6
Heart Girth	97.25	97.62	89.12	99.18	101.01	101.5
Breadth at Shoulders	27.13	28.24	26.00	30.23	38.44?	30.5
Depth of Chest	31.06	30.37	27.50	32.4	38.33?	32.9

TABLE XII.

THE GROWTH OF THE OFFSPRING OF IMMATURE SOWS

COMPARED WITH THE GROWTH OF THE OFF-

SPRING OF MATURE SOWS

To 11 months of age.

Average records:

By generations.

Factor	Original Stock		First Generation		Second Generation	
	Immature Sows	Mature Sows	Immature Sows	Mature Sows	Immature Sows	Mature Sows
Avg. Wt. of Body	140.0	148.95	166.86	128.90	186.6	118.89
Height at Withers	53.13	54.50	45.81	55.95	50.3	55.00
Length of Body	75.31	80.25	71.87	88.55	85.0	85.63
Heart Girth	97.25	98.75	89.12	108.23	101.01	107.50
Breadth at Shoulders	27.13	28.94	26.00	32.13	38.44(?)	32.25
Depth of Chest	31.06	32.13	27.50	34.63	38.33(?)	34.25

GROWTH OF OFFSPRING

IMMATURE SOWS

The table following gives the average record of the immaturesly-bred sows up to and including 24 months of age. This includes the records to date and gives a better insight into the subject as to the effect of early breeding on the growth of the offspring for two-year period. There are, however, only two generations to consider in this case.

From this table it will be seen that the weight of the original stock was not equalled by the first or second generations at two years of age. The first generation was 7.62 lbs. lighter and the second generation 10.71 lbs. lighter than the original stock. As found in the previous tables on this subject, with the exception of the average weight of body, the first generation was inferior in every point considered for immature sows, compared with the original stock. The first generation was 3.05 smaller than the original stock at height at withers, 4.10 shorter in length of body, 6.13 smaller in heart girth, .83 narrower in breadth of shoulders and 3.36 shallower in depth of chest. These measurements are all in centimeters.

With the exception of average weight of body and depth of chest, the second generation was larger than the

TABLE XIII.

EFFECT OF EARLY BREEDING ON THE GROWTH
OF THE OFFSPRING

Average Record of Immature Sows to 24 Months

Factor	Original Stock		First Generation		Second Generation	
	V	VI	XI	XIV	XXI	XXII
Avg. Wt. of Body	225.79	188.89	202.34	197.10	Died	196.63
Height at Withers	57.65	56.13	55.73	51.95	May 4 1911	57.60
Length of Body	87.35	85.00	81.45	82.70		92.80
Heart Girth	110.1	104.45	103.09	99.20		108.9
Breadth at Shoulder	31.75	29.55	30.04	28.60		33.90
Depth of Chest	36.08	34.00	32.46	31.90		33.90

AVERAGE

Original Stock	First Generation	Second Generation
207.34	199.72	196.63
56.89	53.84	57.60
86.18	82.08	92.80
107.28	101.15	108.9
30.15	29.32	33.9
35.04	31.68	33.9

original stock and first generation, bearing out the summary drawn from the table of the immature sows to eleven months of age. The 24 months old table for immature sows shows more emphatically than the table for the 11 months old immature sows that the first generation is inferior to the original stock and the succeeding generations, and that the second generation is larger than both the original stock or the first generation.

For a more concrete view of the matter, the following table has been arranged to show the difference in growth and development of the first generation of the sows at eleven months and twenty-four months of age, in favor of the original stock, showing the effect of age in the comparative figures.

TABLE XIV.

	<u>IMMATURE SOWS</u>	
	First Generation 11 months old	Second Generation 24 months old
Avg. Wt. of Body	26.86	7.62
Height at Withers	7.32	3.05
Length of Body	3.44	4.10
Heart Girth	8.13	6.13
Breadth at Shoulder	1.13	.83
Depth of Chest	3.56	3.36

This table shows plainly the inferiority of the first generation of immaturity-bred sows both at 11 months and 24 months old, compared with the original stock. They were inferior in every point considered, with one exception. The first generation of sows at 11 months old exceeded the original stock in weight of body by 26.86 lbs.

Pertaining to this subject, Das made conclusions as follows:

(1) The first generation of animals from immature parents is inferior to the original stock.

(2) The second generation of animals as the result of continuous early breeding, is equal to, if not better than, the original stock, while it has decided superiority over the first generation.

CHAPTER V

THE INFLUENCE OF THE AGE OF THE SOW
ON THE SIZE OF THE LITTER

To determine whether or not the age of the sow influenced the size of the litter, the following tables were compiled from figures taken in this experiment.

TABLE XV.

SIZE OF LITTERS

IMMATURE SOWS

Factor	Number of litter							Avg.No. Pigs Farrowed	Total No. pigs Farrowed
	1st	2nd	3rd	4th	5th	6th	7th		
V	3	7	10	9	9	11	-	8.16	49
VI	8	9	10	8	4	4	11	7.71	54
XI	3	6	4	7	9	6		5.83	35
XIV	6	7	9					7.33	22
XXI	3 (died)							3.00	3
XXII	6	3	5	9				5.75	23
Total	(Average 4.83)								186

TABLE XVI.

HALF-MATURE SOWS

III	9	7	9	10				8.75	35
VII	7	7						7.00	14
Xa	3							3.00	3
Total	(Average 6.33)								52

TABLE XVII.
SIZE OF LITTERS
MATURE SOWS

Factor	1st Litter	2nd Litter	3rd Litter	4th Litter	Avg.No. pigs Farrowed	Total No. pigs Farrowed
IV	5	8	3	5	5.25	21
VIII	8	6	-	-	7.00	14
Average	6.50			Total		35

From the above tables it will be found that the average number of pigs farrowed by immature gilts was 4.83, by half-mature gilts 6.33, and by mature gilts 6.50, showing that the half-mature gilts farrowed 1.5 more pigs to the litter than the immature gilts and that mature gilts farrowed .17 more pigs than the half-mature gilts.

James Long in his text, "The Book of the Pig", in discussing unequal litters, make the following statement relative to the number of pigs which a gilt usually has: "A gilt generally produces from two to eight pigs, and although the former number is absurdly small, yet we have found in practice that, when weaned and ready to sell, they usually realize as much as four pigs from an ordinary gilts litter. A gilt should not rear more than eight, unless she is

unusually large, has plenty of milk, and is more mature than is customary."

Rommel, (The Inheritance of Size of Litters in Poland China Sows, Annual Report of the American Breeders' Association- Vol. III, 1907), found in his investigations that the average size of litters in sows which he considered was as follows:

AVERAGE SIZE OF LITTERS

1 year old sows	6.6
2 year old sows	7.5
3 " " "	7.9
4 " " "	8.3
5 " " "	8.7

Average size of litters for sows 1 to 5 years old, 7.4

The Iowa College of Agriculture gives the following relative to the size of litters: "The following averages are compiled from litters representing the Poland China, Duroc Jersey, Chester White, Berkshire, Tamworth and Yorkshire breeds. The data includes records from the Iowa State College herd for the years 1903 to 1905 inclusive, and records from Mr. Atkinson's Yorkshire herd near Des Moines, and Mr. O'Donnell's Poland China herd near Ames, for the spring of 1906. The investigations show that 95 yearling sows farrowed 678 pigs averaging 7.14 pigs per

litter; 72 two-year-old sows farrowed 637 pigs, averaging 8.85 pigs per litter; and 33 aged sows farrowed 306 pigs averaging 9.27 pigs per litter. The two-year-old sows farrowed 23.9 per cent more pigs per litter than the yearling sows. The aged sows farrowed 29.83 per cent more pigs than the yearling sows, and 4.74 per cent more pigs per litter than the two-year-old sows. The two-year-old sows farrowed 9.38 per cent and 12.08 per cent respectively larger pigs at birth than did the yearling sows, and the pigs from the two-year-old sows made 26.31 per cent greater gains than the pigs from the yearling sows."

From the above it is evident that the old sows are the more satisfactory breeding animals.

The relative efficiency of old and young sows was tested in another experiment at the Iowa Experiment Station. Fifteen gilts bred at eight months of age averaged 7.66 pigs per litter; sows twenty-four months old averaged 9.6 pigs, and aged sows averaged 10.6 pigs. Pigs from the gilts weighed an average of 2.39 pounds at birth, from the two-year-old sows 2.63 pounds at birth, and from the aged sows 2.61 pounds at birth. When six weeks old, pigs from the gilts had made an average daily gain of .32 pounds

while the pigs from the older sows had gained .40 pounds daily.

At the North Platte Experiment Sub-Station similar results have been obtained. Data dealing with the cost of producing a fifty-pound pig, shows that the average size of litters farrowed from the sows used in the experiments was approximately 20 per cent larger for old sows than for gilts.

Dawson states the good bone structure and good quality of bone are essential in a profitable hog. They are indicative of strong constitution. Pigs from matured sows are generally stronger at birth, have better chances to survive the first few critical days, seem to adjust themselves to conditions more readily and to make better growth, with but few of the troubles that affect small pigs, than do those from immature sows. Nearly all winning show animals and the best bunches of pigs or finished hogs are from matured dams. Dawson adds that we cannot expect immature gilts or fat sows to be as prolific or produce as strong and healthy litters as older and maturer brood sows.

The following table shows the effect on the size of the litter as the dam grows older. All 42 litters, including 27 litters by immature sows, 8 litters by half-mature

sows and 7 litters by mature sows, are accounted for in this table.

Under the table for immature sows it will be noticed that the size of the litters increased as the sows grew older, varying from an average of 4.83 pigs in the first litters at from 9 to 12 months of age, to an average of 11 pigs in the last litter at 49 to 50 months of age. There is but one litter reported, however, in the period at from 49 to 50 months of age, but the data goes to show that it is safe to conclude that the size of the litters increase in immaturesly bred sows as the sows grow older. The fourth age period, 26 to 30 months, showed the next largest average number per litter of 8.25 pigs. It will be noticed that there was a steady increase in the average size per litter from the first ageperiod to the fourth age period, inclusive, and but for a very few instances of variation this increase could reasonably have been expected to hold its own for the next three periods, from all appearances.

Jones states that practical breeders seem inclined to believe that the offspring from the young immature parents are smaller and weaker, perhaps due to the inheritance of such characters from the parents. In other words, the average breeder of livestock believes in the transmission of acquired characteristics.

TABLE XVIII.

THE EFFECT OF THE AGE OF THE SOW ON THE
SIZE OF THE LITTER
IMMATURE SOWS

Factor	Age in Months						
	9-12	15-19	22-25	26-30	34-36	40-44	49-50
V	3	7	10	9	9	11	-
VI	8	9	10	8	4	4	11
XI	3	6	4	7	9	6	-
XIV	6	7	9	-	-	-	-
XXI	3	-	-	-	-	-	-
XXII	6	3	5	9	-	-	-
Total No. of Pigs	29	32	38	33	22	21	11
No. of Instances	6	5	5	4	3	3	1
Average Size Litter	4.83	6.4	7.6	8.25	7.3	7	11

TABLE XIX.
HALF-MATURE SOWS

III	-	-	9	7	-	9	10
VII	-	-	-	7	7	-	-
Xa	3	-	-	-	-	-	-
XIa	-	3	-	-	-	-	-
Total No. of Pigs	3	3	9	14	7	9	10
No. of Instances	1	1	1	2	1	1	1
Avg. size of Litter	3	3	9	7	7	9	10

TABLE XX.
MATURE SOWS

Factor	Age in Months						
	9-12	15-19	22-25	26-30	34-36	40-44	49-50
IV	-	-	-	5	8	3	5
VIII	-	-	-	-	8	6	9
Total No. of Pigs	-	-	-	5	16	9	14
No. of Instances	-	-	-	1	2	2	2
Avg. size of Litter	-	-	-	5	8	4.5	7

TABLE XXI.
GRAND TOTAL FOR
THREE CLASSES OF SOWS

Total No. of Pigs	32	35	47	52	45	39	35
No. of Instances	7	6	6	7	6	6	4
Avg. Size of Litter	4.57	5.84	7.84	7.43	7.5	6.5	8.75

The table for half-mature sows shows almost the same data, i.e., that the size of the litters increase with the increase of age of the mother. It will be noted that the first litter, in the first age period, averaged 3 pigs, compared with an average of 10 pigs in the last age period. Both the third and fifth age periods show an average of 9 pigs per litter, which gives an insight of what can be expected as the sow grows older. The increase in the size of the litter as the mother grows older in the half-mature

sows is not as gradual as is the increase in the size of the litters for sows in the immature class.

While the figures for the mature sows are not as uniform as those of the immature and half-mature sows, there is sufficient emphasis to the data to warrant the same summaries as were drawn for the other two classes of dams, that is, that the size of the litter increases with the increased age in the mother. The largest average number of pigs was secured from the mature sows in the fifth age period, with 8 pigs while the seventh age period was second with one pig less per litter average.

In the final statement, or grand total for all three classes of sows, we find that the figures substantiate the conclusion drawn for the three distinct classes,- that the size of the litters increase as the sow grows older. There is a gradual increase in the average size per litter in the first three age periods of 4.57 pigs, 5.84 pigs and 7.84 pigs respectively. The highest average number of pigs per litter was secured in the seventh age period, 49 to 50 months. The second highest average number of pigs per litter was secured in the third age period, 22 to 25 months. From the third to the fifth age period, inclusive, the average size per litter varies but little, (7.43 to 7.84) then drops off slightly in the sixth age period to

an average of 6.5 pigs per litter.

From the data compiled, it seems safe to conclude that the size of the litter increases with the age of the sow, barring allowances for individuality.

Mr. Rommel found practically the same information in his study of the Poland China Records of 1902, Chap. IV, Sec. 3.

Prof. Ellis Rail, University of Nebraska, makes the following statement in referring to age as being one of the factors influencing prolificacy: "I refer here to the fact that the young sow, that is the gilt, will not produce as large a litter on the average, as will older sows. And such data as I have been able to get indicates that sows do not reach their full degree of prolificacy until two years old. The records of the breeding herd of sows kept at the Iowa Experiment Station where over sixty litters a year are farrowed, showed, when taken for a period of four years, that gilts produced about 10 per cent fewer pigs than yearlings sows, and that yearling sows were about that much below older sows."

It is interesting to note in connectinn with Prof. Rail's statement that sows do not reach their full degree

of prolificacy until two years old, that the figures in the above table show that the sows in this experiment did not reach their full degree of prolificacy until they were from twenty-two to thirty months old and over. It is true, however, that larger litters were farrowed when this age was passed, but the nearest to a full degree of prolificacy was not reached until at least twenty-two months of age.

CHAPTER VI

PERIOD OF GESTATION

The length of the period of gestation in sows is variable, and no exact date can be given, but sixteen weeks is the time usually given as the period of gestation. It will be seen from the following table that the gestation period in the sows in this experiment varied from 109 to 118 days. 112 days is said to be standard as a period of gestation, and there is, in most breeders' judgment, no domestic animal so true to time in this respect as the sow.

TABLE XXII.

PERIOD OF GESTATION

IMMATURE SOWS

Factor	No. of Litters	Period of Gestation by Litters							Avg. each Sow
		1	2	3	4	5	6	7	
V	6	115	114	113	-	114	112	-	113.6
VI	7	113	113	116	109	112	111	113	112.4
XI	6	113	114	-	113	114	115	-	113.8
XIV	3	114	112	111	-	-	-	-	112.3
XXI	1	No record							
XXII	4	114	111	112	111	-	-	-	112.0
Average of all		113.8	113	113	111	113.3	112	113	112.8

TABLE XXIII.
HALF-MATURE SOWS

Period of Gestation by Litters						
Factor	No. of Litters	1	2	3	4	Average each sow
III	4	115	-	111	113	113
VII	2	115	-	-	-	115
Xa	1	No record				
XIa	-	"	"			
Average for all		115	-	111	113	114

TABLE XXIV.
MATURE SOWS

Period of Gestation by Litters						
Factor	No. of Litters	1	2	3	4	Average each sow
IV	4	112	-	113	118	114.3
VIII	3	115	112	116	-	114.3
No record of Xb, XIb, XIIb, XIIIb						
Average of all		113.5	112	114.5	118	114.3

TABLE XXV.
FOR ALL CLASSES
PERIOD OF GESTATION

<u>Factors</u>	<u>Average period of gestation, days.</u>
Immature	112.83
Half-mature	114.00
Mature	114.30
Average	113.71

It was found that the immature sows in this experiment had an average period of gestation of 112.83 days; half-mature sows 114 days, and mature sows 114.30 days. The average period of gestation of all sows was 113.71 days.

It was found that the average period from service to farrowing of sows is, as near as possible, sixteen weeks. The variations in the time which a sow will carry her pigs are comparatively slight and these are pretty well regulated by the age and condition of the sow; thus old sows in this experiment most frequently brought forth a day or two after the expiration of the

sixteen weeks (112 days); half-mature sows generally farrowed on the one hundred and fourteenth day, while young immature gilts farrowed on or about the one hundred and twelfth day on an average.

Coburn, writing in Swine Husbandry, states that old sows will carry their pigs 112 or possibly 115 days, and young sows will sometimes farrow their first litter in from 100 to 106 days from the date of service.

Dawson states that the time of gestation varies from 112 to 118 days, but is generally about 114 days. Pigs farrowed much before 112 days are usually weak and hard to save, and those that are farrowed after the regular time generally have some condition that causes considerable trouble in raising them. Experience has shown that the strongest and most easily raised litters are farrowed in or between the common minimum and maximum periods given.

Iowa Bulletin No. 4 includes the following: "The average period of pregnancy is 112 days, but may vary a few days on either side of the 112-day mark. The time for farrowing will depend largely upon local conditions."

Wisconsin Bulletin No. 184 comments on this subject as follows: "The period of gestation for swine averages

112 to 116 days."

From the above, it will be noted that the sows in this experiment farrowed after the pigs were carried the number of days usually considered, 109 to 118 days, varying according to age and condition, and local conditions, especially.

CHAPTER VII

THE EFFECT OF THE AGE OF THE SOW ON
THE WEIGHT OF THE PIGS AT BIRTH

The following three tables give a summary of the number of litters farrowed, and the average weight at birth of both boars and sows in each litter of the sows in the three different classes of females. The fourth table gives the average weight of the boars and sows at birth for all the sows in each of the three different classes of sows.

TABLE XXVI.

IMMATURE SOWS

Factor	Number of Litters Farrowed	Average weight at birth	
		Boars	Sows
V	6	2.083	2.048
VI	7	2.267	1.911
XI	6	2.541	2.400
XIV	3	2.597	2.497
XXI	1	Dead at birth (3)	
XXII	4	2.733	2.472
Average	27	2.444	2.265

TABLE XXVII.
HALF-MATURE SOWS

Factor	Number of litters farrowed	Average weight at birth	
		Boars	Sows
III	4	2.893	2.623
VII	2	No record	
Xa	1	No record	
XIa	-	No record	
Average	7	2.893	2.623

TABLE XXVIII.
MATURE SOWS

Factor	Number litters farrowed	Average weight at birth	
		Boars	Sows
IV	4	3.123	3.316
VIII	3	2.850	2.950
Xb, XIb, XIIb, XIIIb, no record as yet.			
Average	7	2.986	3.133

TABLE XXIX.
EFFECT OF AGE OF SOW ON WEIGHT OF PIGS AT BIRTH
FOR ALL CLASSES
OF SOWS

Factors	Number of litters farrowed	Average weight at birth	
		Boars	Sows
Immature	27	2.444	2.265
Half-Mature	7	2.893	2.623
Mature	7	2.986	3.133

TABLE XXX

Factors	Number of sows	Number of pigs farrowed	Average weight per pig at birth pounds
Immature	6	186	2.315
Half-mature	3	52	2.658
Mature	2	35	3.093

It will be noted from the last table that the 6 immature sows farrowed 186 pigs in 27 litters, with an average weight per pig at birth in pounds of 2.315; 3 half-mature sows farrowed 52 pigs in 7 litters with an average weight per pig at birth in pounds of 2.658, and 2 mature sows farrowed 35 pigs in 7 litters, with an average weight per pig in pounds of 3.093. The pigs from mature sows weighed .778 pounds more than pigs from immature sows and .435 pounds more than pigs from half-mature sows, while pigs from the latter weighed .343 pounds more than pigs from immature sows at birth.

These figures are practically duplicated in the table showing the average weight of pigs of both sexes at birth from the three classes of sows. The boar pigs farrowed by mature sows weighed at birth .093 pounds more than boar pigs farrowed by half-mature sows and .542 pounds more than boar pigs farrowed by immature sows. Boar pigs from half-mature sows at birth weighed .449 pounds more than the pigs from immature sows. The sow pigs farrowed by mature sows had an average weight at birth of 3.133 pounds, which were .510 pounds heavier than female pigs at birth farrowed by half-mature sows and .868 pounds heavier than sow pigs at birth farrowed by immature sows. The sow pigs at birth farrowed by

half-mature sows weighed .358 pounds more than sow pigs farrowed by immature sows.

The figures in the foregoing tables relative to the effect of the age of the sow on the weight of the pigs at birth correspond to those obtained at the Iowa State College of Agriculture. The data compiled in Iowa Bulletin No. 4 follows:

		Average weight per pig, birth
19 yearling sows farrowed	134 pigs	2.40 lbs.
19 two-year old sows	" 172 "	2.625 "
8 aged sows farrowed	76 "	2.69 "

The Iowa Experiment Station also found that fifteen gilts bred at eight months averaged 7.66 pigs weighing on an average of 2.39 pounds; fifteen gilts bred at twenty-four months averaged 9.6 pigs weighing on an average of 2.63 pounds, and fifteen aged sows averaged 10.6 pigs weighing on an average of 2.61 pounds.

The influence of age on the size and weight of litters has been well tested at the Agricultural Experiment Station of Wisconsin, and the results may be briefly stated. The performances of sows of various ages were recorded, and the average number of pigs in

each litter- together with the average weight of each litter- was ascertained as follows:

Age of Sows	No. of pigs	Weight of litters in pounds
4 to 5 yrs old	9.0	26.0
2 to 3 " "	7.5	19.7
1 year old	7.8	14.2

Coburn, in Swine Husbandry, writes as follows: "A comparison of the litters from matured sows, with those of others, that were mere pigs themselves when bred, furnishes a practical illustration of the influence of the age of the sow on the weight of the pigs at birth. The pigs from the large, old sows, will be more in number, and frequently double the size of the others, at a month old; and with the same care, they will not infrequently weigh 50 per cent more at nine or twelve months old."

If we accept the lesson that the foregoing figures

tend to teach, we are bound to believe that the older sows are better mothers than young sows, and that the too common practice of reserving the young for stock and selling the older animals is not to be commended.

It is the general opinion among practical breeders that as sows grow older and larger, they produce heavier pigs, but animals bred when immature have lactation facilities impaired to such an extent that nourishment is not normal. It would seem, then, that it is not a matter so much of age when the animal was bred, but that it is a matter of nutrition, evidently.

The following tables deal more explicitly with this subject, and show the records for each individual in all three classes of sows, giving the records for each litter, the age of the sow when the litter was farrowed, the average weight at birth of the boars and the sows, and the difference in weight of the first and last litters, either plus or minus.

A study of these tables will bring out practically the same material as explained in the previous discussion of this subject.

TABLE XXXI.
FACTOR V. IMMATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	10 mos. 6 days	2.75	2.50
2nd	18 mos. 16 days	1.70	1.875
3rd	24 mos. 8 days	1.80	1.916
4th	30 mos. 29 days	2.25	2.000
5th	36 mos. 27 days	2.00	2.250
6th	44 mos.	2.00	1.750
Difference in weight of 1st & last litter		-.75	-.750

It will be noted from this table that the pigs were never ^{as} heavy in any litter as in the first litter either in boars or sows. This may be an instance of impaired lactation performance.

TABLE XXXII.
FACTOR VI. IMMATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	8 mos. 29 days	1.5	2.19
2nd	17 mos. 23 days	2.33	2.125
3rd	24 mos. 25 days	1.66	1.5
4th	30 mos. 2 days	2.60	2.00
5th	36 mos. 29 days	3.31	-
6th	42 mos.	2.81	-
7th	49 mos.	1.66	1.74
Difference in weight of 1st & last litter		+1.6	-.45

TABLE XXXIII.
FACTOR XI. IMMATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	10 mos. 18 days	2.75	2.50
2nd	16 mos. 15 days	2.25	2.10
3rd	21 mos. 22 days	3.00	3.00
4th	27 mos. 27 days	2.25	2.20
5th	34 mos. 5 days	2.50	2.00
6th.	40 mos. 7 days	2.50	2.60
Difference in weight of 1st & last litters		-.25	+.10

TABLE XXXIV.
FACTOR XIV. IMMATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	10 mos.	2.50	2.125
2nd	16 mos. 13 days.	2.625	2.70
3rd	22 mos. 14 days	2.67	2.67
Difference in weight of 1st & last litters		+.17	+.541

TABLE XXXV.

FACTOR XXII. IMMATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	10 mos. 2 days	2.40	2.25
2nd	15 mos. 5 days	3.25	-
3rd	24 mos.	2.625	2.67
4th	30 mos.	2.66	2.50
Difference in weight of 1st & last litters		+ .26	+ .25

It will be seen from the last five tables that the average weight at birth of the boars and sows from the immature factors varied considerably, and age seemed to have no specific effect. The figures are indeed variable, but give a general idea of what can be expected relative to the weights of the different sexes at birth from immature parents on the dam's side.

TABLE XXXVI.

FACTOR III. HALF-MATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st.	12 mos. 19 days	3.28	3.12
2nd.	33 mos. 12 days	-	-
3rd.	-	2.80	2.25
4th.	-	2.60	2.50
Difference in weight of 1st & last litters		-.68	-.62

Both the boars and the sows from this half-mature factor had a lower average weight at birth in the fourth litter than they did in the first litter, but this being the only half-mature factor from which records can be compiled at the present time it is useless to attempt to draw any definite or prospective conclusions.

The average weights at birth, however, from this one half-mature sow, show an inclination toward heavier pigs at birth from the half-mature than from the immature sows, which speaks for more thrifty pigs.

TABLE XXXVII.

FACTOR IV. MATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	28 mos. 14 days.	2.70	2.70
2nd	35 mos. 10 days	-	-
3rd	44 mos. 3 days	3.37	3.25
4th	-	3.30	4.00
Difference in weight of 1st & last litters		-.60	-1.30

TABLE XXXVIII.

FACTOR VIII. MATURE

Litter	Age of Sow	Average weight at birth	
		Boars	Sows
1st	35 mos. 11 days	2.70	2.91
2nd	44 mos. 11 days	4.00	4.00
3rd	49 mos. 28 days	-	-
Difference in weight of 1st & last litters		-1.30	-1.09

It will be noted that in each case of the mature factors, the boars and sows of both factors were increasing in weight as the sow grew older. It is also

interesting to note the general increased heaviness of the pigs from the sows which were bred after being permitted to mature and the sows which were bred before maturity.

All the tables bearing on the average weight at birth of the pigs from the individual sows make an interesting study, especially since the exact age of the animal shows what can usually be expected from sows in field conditions.

CHAPTER VIII

THE INFLUENCE OF THE AGE OF THE SOW ON
THE NUMBER OF PIGS BORN DEAD AND
THE PERCENTAGE OF PIGS
RAISED

It is generally believed that sows which are bred when young will farrow a greater number of dead pigs than those sows which are permitted to grow out more before being bred. It is also believed that the more maturely-bred sows will raise a larger per cent of the pigs farrowed. This experiment has furnished some interesting data in this regard, which is included in the following tables.

The following three tables deal with the effect of the age of the sow on the number of pigs born dead, and consider each class of sows separately, showing the results of each litter.

TABLE XXXIX.

NUMBER OF PIGS BORN DEAD
MATURE SOWS

Factor	1st.litter	2nd.litter	3rd.litter	4th.litter	Total
IV	1	0	0	0	1
VIII	1	0	0	0	1
Total	2	0	0	0	2

TABLE XL.
NUMBER OF PIGS BORN DEAD
HALF-MATURE SOWS

Factor	1st litter	2nd litter	3rd litter	4th litter	Total
III	0	0	0	1	1
VII	0	0	0	0	0
Xa	0	0	0	0	0
Total	0	0	0	1	1

TABLE XLI.
NUMBER OF PIGS BORN DEAD
IMMATURE SOWS

Factor	Number of Litter							Total
	1st	2nd	3rd	4th	5th	6th	7th	
V	0	0	0	4	0	0	0	4
VI	0	1	0	0	0	0	4	5
XI	0	0	0	1	0	0	0	1
XIV	1	0	0	-	-	-	-	1
XXI	3	-	-	-	-	-	-	3
XXII	5	1	0	0	-	-	-	6
Total	9	2	0	5	0	0	4	20

The mature sows, Factors IV and VIII farrowed 2 dead pigs, one each, and these dead pigs came in the first litter of each sow.

The half-mature sows farrowed but 1 dead pig, this pig having been farrowed in the fourth litter of Factor III.

The immature sows farrowed 20 dead pigs, the pigs coming in the first, second, fourth and seventh litters. Every one of the immature sows farrowed one or more dead pigs at some time in its life. The greatest number of dead pigs were farrowed in the first litters, there being a total of 9 dead pigs farrowed by three sows, Factors XIV, XXI, and XXII in their first litters. Factor XXII farrowed the greatest number of dead pigs of the immature sows, a total of 6, these being farrowed in the first and second litters. It will be noted that Factor XXII farrowed 5 dead pigs in her first litter. There were a total of 6 pigs in this litter, and but one pig was born alive. This remaining pig died at 21 days old, and during its life it was decidedly weak. Factor XXI had 3 pigs farrowed dead in her first litter. This was the total number of pigs in the litter.

TABLE XLII.

NUMBER OF PIGS RAISED

MATURE SOWS

Factor	1st litter	2nd litter	3rd litter	4th litter	Total
IV	1	8	3	5	17
VIII	3	3	-	-	6
Total	4	11	3	5	23

TABLE XLIII.

NUMBER OF PIGS RAISED

HALF-MATURE SOWS

Factor	1st litter	2nd litter	3rd litter	4th litter	Total
III	6	7	5	5	23
VII	2	7	-	-	9
Xa	-				0
Total	8	14	5	5	32

TABLE XLIV.

NUMBER OF PIGS RAISED

IMMATURE SOWS

Factor	Number of Litter							Total
	1st	2nd	3rd	4th	5th	6th	7th	
V	3	5	3	5	3	7	-	26
VI	8	8	4	7	4	3	6	40
XI	3	5	0	6	7	-	-	21
XIV	5	7	0	-	-	-	-	12
XXI	0	-	-	-	-	-	-	0
XXII	-	-	4	-				4
Total	19	25	11	18	14	10	6	103

The last three tables have to deal with the influence of the age of the sow on the number of pigs raised, and consider the three classes of sows separately and each litter of each sow. It will be noted that the mature sows raised 23 pigs, compared with 32 pigs for the half-mature sows and 103 pigs for the ⁱⁿmature sows. While these figures seem to have no great bearing as they stand relative to the influence of the age of the sow on the number of pigs raised, a comparison of all the figures in the past six

tables show some results worthy of consideration. In order to condense the material a final table has been arranged combining the figures in the past six tables as follows, which gives the total number of pigs farrowed, the total number of pigs born dead and the total number of pigs born alive, and the total number of pigs raised, and a final percentage of the pigs raised, the figures including the three classes of sows as units.

TABLE XLV.

THE INFLUENCE OF THE AGE OF THE SOW ON
THE PERCENTAGE OF PIGS RAISED

Factors	Total No. pigs farrowed	Total No. pigs born dead	Total No. pigs born alive	Total No. pigs raised	Per Cent pigs raised
Immature	186	20	166	103	62.04
Half-Mature	52	1	51	32	62.75
Mature	35	2	32	23	71.88

From the foregoing table it will be seen that the immature sows farrowed a total number of pigs of 186, 20 of which were born dead, and 166 born alive, 103 or 62.04 per cent of which were raised.

The half-mature sows farrowed 52 pigs, 1 of which was born dead, 51 alive, and 32 pigs or 62.75 per cent raised.

There is a difference of but .71 per cent in the per cent of pigs raised by immature and half-mature sows. The mature sows farrowed a total of 35 pigs, 2 of which were born dead, 32 alive, and 23, or 71.88 per cent of them were raised, which shows a decided advantage in this respect for the more maturely-bred sows. The mature sows raised 9.13 per cent more pigs than did the half-mature sows and 9.84 per cent more pigs than did the immature sows.

These figures are decidedly in favor of the mature dams so far as the mortality in young pigs is concerned. While there is not a great deal of difference in the percentage of pigs raised by the immature and half-mature sows, there is a sufficient difference to warrant the conclusion that it is best to breed the more mature animals, and the fact that there was such an increased percentage of pigs raised by the mature sows emphasizes this point the more.

Prof. Rail of Nebraska in speaking of prolificacy in swine, says that altogether twenty dollars is a very conservative estimate, in fact, is a minimum cost, for maintaining a fair sized brood sow for a year. "Of course," says Prof. Rail, "This is estimating results from only one litter per

year. I have put it in this fashion to show, in a way at least, why the sow should raise two litters per year instead of one. A sow's litter, then, at weaning time must be worth at least twenty dollars, exclusive of what they might be fed other than through the dam, prior to weaning. Only five pigs would scarcely be worth \$20 at weaning time. It would take six to offset cost, and there would be no profit until the seventh pig."

The matter of saving as many as possible of the pigs farrowed and farrowing live pigs, is a subject which deserves a great deal of attention, and the above figures point out decisively the advantage to be gained in breeding the more mature animals.

Dawson in this connection writes as follows: "Pigs from matured sows are generally stronger at birth, have better chances to survive the first few critical days, seem to adjust themselves to conditions more readily and to make better growth, with but few of the troubles that affect small pigs, than do those from immature sows. Nearly all winning show animals and the best bunches of pigs or finished hogs are from matured dams."

CHAPTER IX

THE INFLUENCE OF THE PERIODS OF PREGNANCY
AND LACTATION ON THE GROWTH OF THE DAM

In order to determine whether or not the sows were influenced in their growth by the periods of pregnancy and lactation in this experiment, growth curves were made for each individual sow, showing the growth which the animal made during the periods of pregnancy and lactation, including curves for depth of chest, length of body, weight of body, width of shoulders, height at withers, and heart girth. Indications are made on the growth curves to show when the animals were bred, when they farrowed, and when the litters were weaned, together with data showing whether the sow was accidentally bred, or when she aborted.

Curves are made for the original sows in the experiment and for the sows in the first generation.

From a study of all the curves for all the sows, it is found that as a rule the period of pregnancy does not check the growth of the sow, especially during the first two-thirds of this period. In a few cases it is found that during the last third of the period of pregnancy the sow starts downward in growth, but this does not occur often.

From the information furnished by these curves, it would be safe to conclude that the period of pregnancy does not have a detrimental influence on the growth of the dam.

With very few exceptions, the curves show that the period of lactation has a detrimental effect upon the growth of the mother. A study of this phase of the experiment will show that from the time the litter is farrowed, up to the time the litter is weaned, the sow is taxed to such an extent that her growth is not maintained, but goes down in almost every respect. In most cases this downward growth starts just a short time before the pigs are farrowed, and in nearly all cases continues to go downward or make no growth whatever until the pigs are weaned, with the possible exceptions of where decidedly small litters were farrowed.

The sows regain their normal growth and make additional growth, according to the curves, immediately after and a very short time before the pigs are weaned.

In this connection, it is interesting to note that the immature sows growth curves are nearly always below those of the half-mature and mature sows, bearing out the data

previously discussed in this thesis.

CONCLUSIONS

1. The exact time at which to breed a gilt must be determined by the breeder, taking into consideration the age, development, thrift, and environment of the female, but to obtain the best results the animal should not be bred before twelve months of age.
2. The breeding of immature gilts tends to check the growth of the mother and the growth of the offspring.
3. Pregnancy does not check the growth of sows to any detrimental extent.
4. The period of lactation checks the development or growth of the young sow.
5. The more mature sows resume their normal growth and take on additional growth after weaning a litter of pigs, while immature sows are checked in their growth.
6. The offspring from the more mature sows are larger than the offspring from immature sows.
7. Pigs from the more mature sows weigh more at birth than the pigs from the immature sows.

8. The older sows farrow more pigs per litter than the young, immature sows.

9. The older sows raise a larger per cent of the pigs farrowed than do the young, immature sows.

10. Sows in this experiment did not reach their full degree of prolificacy until near two years old.

11. The beginning of puberty does not represent the best time to breed.

12. The young sows whose growth had been checked by early pregnancy, in this experiment, are permanently small, compared to the older sows.

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